Sample Application 1

Title of Research Project:
Invertebrate Abundance and Skunk Activity On Beaches With Varying Wave Action and Human Activity

Goal: What do you want to do?
I hope to determine the level of invertebrate availability and skunk activity at beaches on Martha's Vineyard, Massachusetts. The data collected would then make it possible to establish whether there is a difference in invertebrate availability in the intertidal zone of high and low energy beaches (beaches with larger and more frequent waves in contrast to those with calmer waters), whether skunk activity in the intertidal zone can be correlated with invertebrate abundance, and whether beaches with high human subsidies have more skunk activity than beaches with low human subsidies.

Rationale: Why do you want to do this work?
I have been a summer resident of Martha's Vineyard for my entire life, and the natural beauty that characterizes this unique island has always held a great deal of meaning for me. Unfortunately, however, over the course of my lifetime I have witnessed numerous disturbing changes in the ecosystem that surrounds me, including a marked decrease in the presence of shorebirds and a dramatic increase in litter left behind by visitors, which is harmful to wildlife. Fortunately, there are numerous organizations devoted to protecting the fragile ecosystems of the region, and last year I was inspired by my worrisome observations to become involved with BiodiversityWorks, a non-profit based on Martha's Vineyard. Through my work there, I have had the opportunity to partake in wildlife conservation projects that have amazed and inspired me. A cause that I have become particularly interested in is protecting nesting shorebirds, and monitoring skunk activity is a critical component of working towards this goal. Receiving a Marjot Foundation grant would permit me to undertake a project that I view as being extremely important to the preservation of the ecosystem both presently and for years to come.

Site: Where will you do this work?
This work will be performed at four beaches on Martha's Vineyard. Below is a list of the beaches that will be analyzed along with rough descriptions of the wave action, size of wrackline and level of human activity at each beach.

Format=Site: Wave Action/Wrackline/Human Activity

1. Cape Poge Bay: Low/Medium-Heavy/Low
2. Lambert's Cove: Low/Medium-Heavy/High

3. Wasque Bathing Beach: High/Light/High
4. Edgartown Great Pond: High/Light/Low

Methods: How will you do the work?

At each site, three transects measuring approximately 1 meter across and stretching between the beginning of the sand dune and the high tide line will be leveled using a push broom and marked using labeled metal stakes. On each transect, a 0.1 m2 section of PVC pipe will be placed on a random wrack clump to designate it as a sample area. The wrack beneath the frame will be evaluated for environmental variables including relative wrack age (categorized qualitatively as new, medium or old), percent composition, temperature and humidity at the point of contact between the wrack and sand temperature beneath the wrack at a depth of 10 cm with a soil thermometer. The wrack will then removed and placed in "Ziploc" plastic bags for later invertebrate analysis. Immediately after the removal of the wrack, core samples of sand will be taken from beneath the removed wrack using a core sampler constructed from a beveled PVC and sieved through a 1-mm mesh screen and stored for later burrowed invertebrate sorting. Invertebrate findings will be "pickled" in glass vials to create a reference collection of species. Finally, pitfall traps will be utilized to measure the presence of mobile nocturnal wildlife. These traps consist of a plastic cup containing a solution of dish soap and water placed in or near the core hole.

Each transect will be examined for the tracks of mammals, birds, and vehicles, including those of skunks. Given that the exact length of the space between the high tide line and the dunegrass will vary depending upon the lunar and tidal cycles, skunk activity will be calculated in terms of number of tracks per square meter. All tracks (skunk and other) will be photographed and geotagged using a Garmin GPSMAP 62stc Global Positioning Unit.

Note: Parts of this procedure were adapted from the methods section of The effects of off-road vehicles on barrier beach invertebrates at Cape Cod and Fire Island National Seashores by Jacqueline M. Kluft and Howard S. Ginsberg

Planning: How long will it take to do the research?

Data will be collected from each of the four sites once every month between June and August of 2014. In the evening portion of the collection period, the transect will be leveled and the pitfall trap will be placed, which will take approximately one hour including transportation to and from the site. The following morning, the site will be revisited and the procedure above will be followed, including the analysis and collection of wrack, core sampling and removal of pitfall traps. This process will take approximately one hour and thirty minutes including transportation. Subsequently, the invertebrates found in the wrack and core sample will be sorted and identified in the BiodiversityWorks laboratory, which will take approximately four hours per site. This comes to a total of six hours and fifteen minutes per site, and given that there will be four sites, each analyzed

three times, the time spent in the field and in the laboratory will be approximately 75 hours. Additionally, approximately 40 hours will be spent analyzing data, creating a poster on this project and writing a paper detailing the results.

Analysis: How will you analyze your data?

After data concerning skunk activity, invertebrate abundance, the presence of other organisms and human activity has been collected using the methods described above, skunk activity will be calculated in number of tracks per meter. The mean number of tracks discovered at each site during different sampling periods will then be calculated, and these values will be compared in an effort to determine the relationship between levels of skunk activity and variables including invertebrate availability, wave action, human activity and the presence of other wildlife. The hypothesis for this experiment is that as invertebrate abundance increases, skunk activity increases in a linear regression.

Significance: What is the value of your research project?

Coastal striped skunks are egg predators of numerous species of endangered shorebirds, including Piping Plovers, Oystercatchers and Terns. Obtaining concrete data on the behavior of skunks would permit biologists to predict when and where skunk activity and bird nesting will take place simultaneously. It would then be possible to time the placement of protective fencing and other such measures appropriately, which would result in the eggs of endangered shorebirds being more effectively protected from predators.

Mentor: This may be your science teacher, a college professor, a scientist at a state or federal laboratory or a scientist at an industrial laboratory. Note that a letter of commitment from your mentor must accompany your application:

Luanne Johnson, a Wildlife Biologist and the founder of the conservation non-profit BiodiversityWorks, has agreed to serve as my mentor for this project. I have been involved with her organization for the past year, and have performed fieldwork on Chappaquiddick and Martha's Vineyard. Working with Luanne has been an incredible experience, and I am confident that she would be an extraordinary mentor for this project.